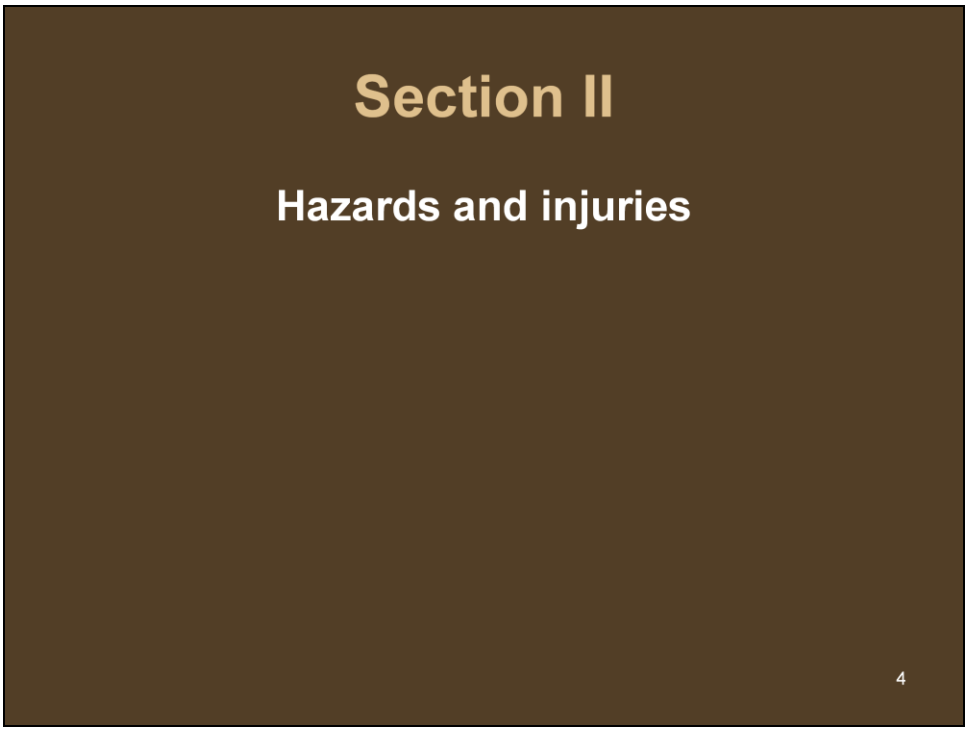
The safe use of power tools involves more than knowing how to select the right tool for the job.

Employees who use portable powered tools are exposed to hazards that could cause serious injuries. A large part of working safely with power tools is understanding the hazards and taking adequate precautions.

This course will describe the hazards of power tool use and the potential for injury; discuss tool selection based on tool quality and design; outline the need for proper job set-up and personal protective equipment (PPE); explain procedures for inspection, maintenance, and repair; and introduce the precautions to follow when using various types of power tools.

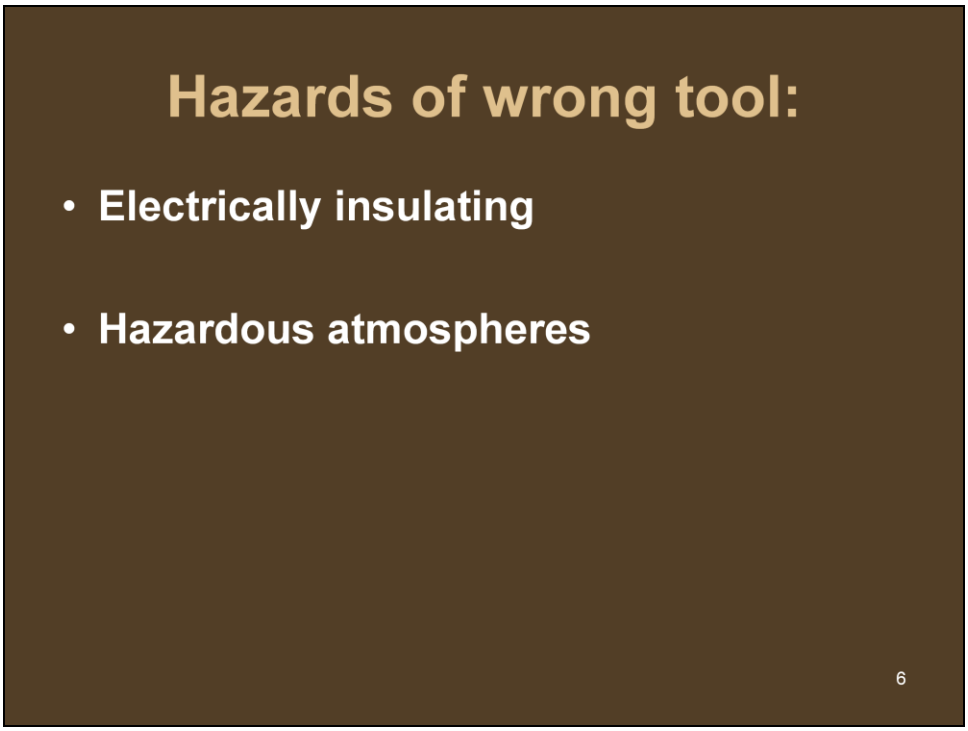


Before you use any type of power tool, make sure you understand the hazards involved.

Using portable powered tools involves exposure to hazards that could cause cuts, puncture wounds, abrasions, contusions, fractures, burns, and other injuries.

For example, many hazards associated with power tools put your eyes at risk for injury. If the material you are working on should shatter, you could get a serious eye injury. Grinding and sawing generates chips and dust that can get into your eyes. If you are looking up to work overhead, any type of tool could cause dust or debris to fall into your eyes.

Portable tools cause other injuries, too. A saw or drill that slips can cause a serious laceration or puncture wound. An attachment that isn't correctly connected to a pneumatic tool could blow free and hit you or a co-worker with tremendous force. Touching an abrasive wheel would cause cuts and abrasions. An electric tool with an improper ground can cause shock or electrocution. A dropped tool can break a toe. Tool use presents plenty of other opportunities for minor scrapes, cuts, or bruises, too.



Other serious injuries can result if the wrong type of tool is used. Work on live electrical parts requires tools with sufficient insulating properties. Tool use in areas where there may be a flammable atmosphere from vapors or dusts requires the use of electric power tools rated for use in hazardous atmospheres. Explosive-actuated tools are prohibited from being used in hazardous atmospheres.

One way to avoid injury is to select and use the right tool for the job.

Tool quality, design:

- Designed for safety
- Durable
- Use appropriate parts

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Portable powered tools are made to provide safe operation. Never remove or by-pass guards that are designed to be part of the tool.

Tools made from good quality, durable materials will help you avoid injuries caused by tools breaking or slipping on the job. Metal tool parts should be strong enough to resist bending, cracking, chipping, or excessive wear from normal use.

Always use the appropriate blades, bits, fasteners, etc. with power tools. Never try to adapt a tool to try to get it to do something that it was not designed to do.

Tool quality, design:

- Handles
- Balance
- Control

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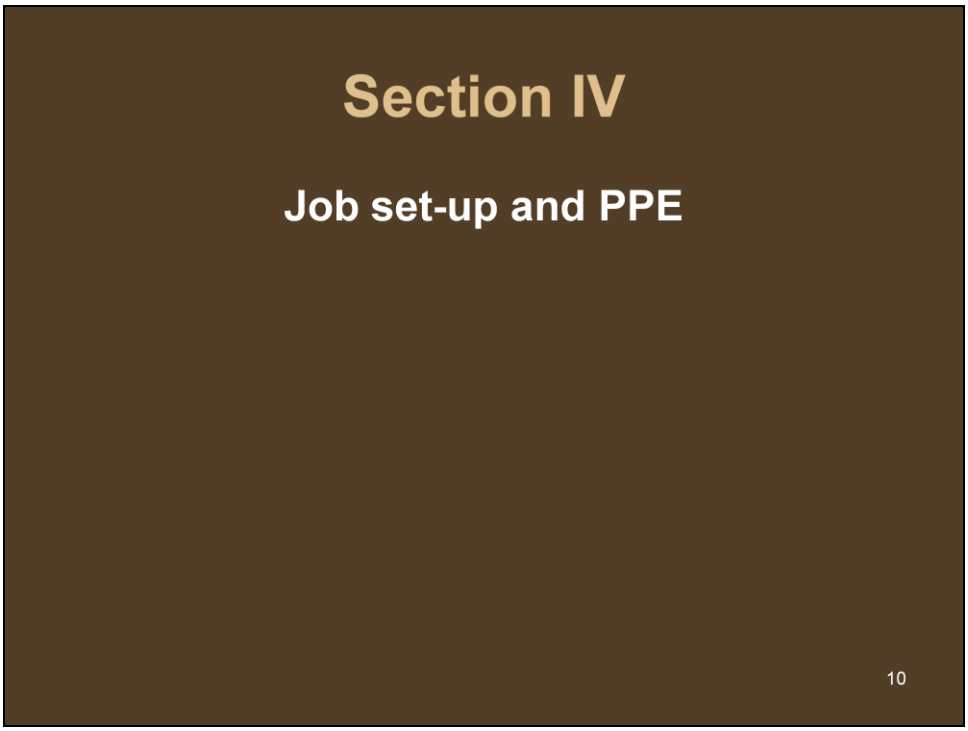
Handles should be shaped to comfortably fit the hand. Avoid handles with sharp edges which can cut off circulation to your fingers during long periods of use.

Tools with cushioned handles help absorb vibration, impacts, or squeezing pressure. Remember to use tools with electrically insulated handles for work on exposed energized parts.

The tool should feel balanced and under control as you grip the handle. Tools work best when you can easily hold, move, and use the tool – avoid using tools that are too heavy or large for you to control.



Two things that you can control – the job set-up and the use of personal protective equipment – are important parts of safe power tool use.

Proper job set-up can improve tool use. You want to easily reach your work without straining muscles, applying force in awkward positions, bending, twisting, or overextending your reach. You are the first person to notice that you are uncomfortable, so make suggestions on how to improve the set-up.

Heavy, forceful tool use is easier to perform when the job is set up slightly lower than waist level. Intricate, lightweight tool use is more comfortable when the job is at or above you waist. If you have to kneel to do the job, wearing kneepads will make the work more tolerable.

Use a vise, clamps, or other means to secure the parts that you are working on. Make sure that you have secure footing and good balance as you use the tool. Injuries can happen if parts or tools slip – causing you to lose your balance and slip. Floors should be kept clean and dry to prevent accidental slips where power tools are used.

While using the tool, take care that any chips or debris will be directed away from yourself and any other people in the area. Setting up protective screens or barricades may be in order for some jobs. Always direct tools and debris so they will move away from aisle areas and other employees working in close proximity.

PPE:

Personal
Protective
Equipment

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Using personal protective equipment (PPE) should become a habit when doing certain jobs.

Eye and face:

- Chips
- Splashes
- Sparks
- Dust

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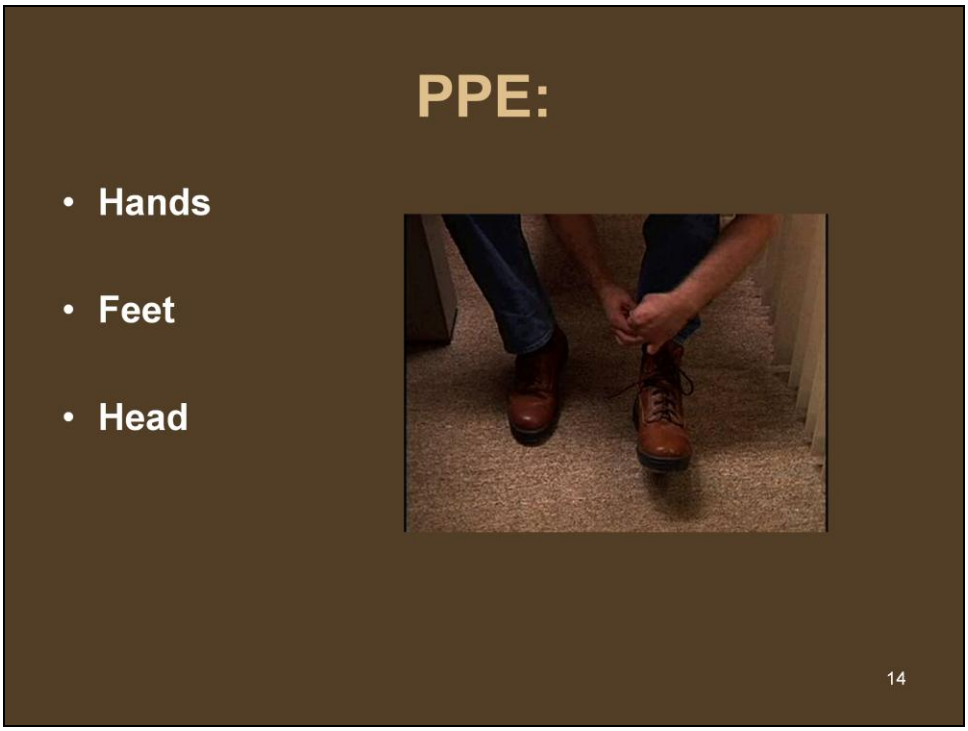
It is up to the employer to assess the hazards in the workplace that require employees to wear PPE. When PPE is required, wear it.

Eye protection is needed if there is a chance that chips, splashes, sparks, dust, or debris could get into your eyes. Some examples of jobs where eye protection should be worn include using staple guns, drills, abrasive wheels, saws, or any other tool that could create chips, pieces or splashes. Eye protection is always required when using explosive actuated tools. For some jobs, face protection may be needed in addition to safety glasses or goggles.



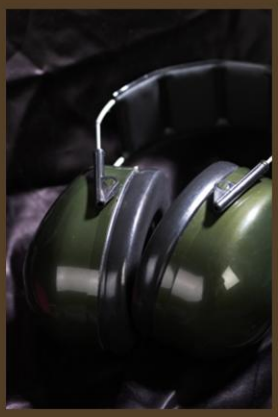
While gloves are not appropriate when working near rotating tool parts, they can help you avoid injury when you need to handle materials that are hot or cold, wet, rough, or sharp.

Another type of protective glove is made with a specialized material that absorbs vibration and the shock of impacts.

Injuries caused by impacts with dropped tools or materials are another consideration. Safety shoes may be required when heavy items could fall or roll onto your feet. Along the same lines, if you'll be working below co-workers who are using tools, you may need to wear a hard hat to protect yourself from falling debris or other items.

PPE:

- Hearing
- Respirators



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Hearing protection may be in order when using power tools. Even short-term overexposure to excessive noise can be damaging.

Tool use might also contribute to your need to wear a respirator. Follow the City of Helena's Respiratory Protection Program and use your respirator correctly.

Before you use, or put away, any power tool, make sure that it is in good shape.

Inspection:

- Handles, casings, guards
- Shafts
- Cords, hoses
- Gripping, striking surfaces

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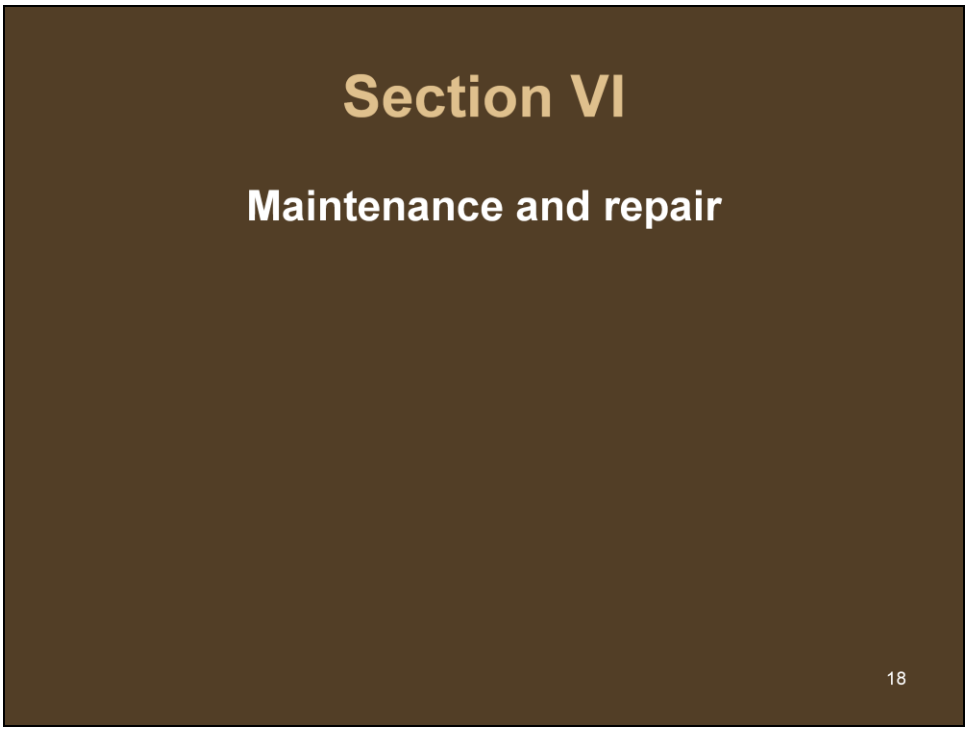
Tools should be inspected before and after each use.

Some signs of damage and war to look for include cracked or loose handles, casings, or guards; bent shafts or spindles; worn, cut, brittle, or frayed cords and hoses; loose or leaking fittings; dull, rounded, or chipped cutting surfaces; gouges or scrapes on gripping surfaces; mushroomed striking surfaces, etc.

Refer to the tool's instruction manual for details on how to inspect the tool.



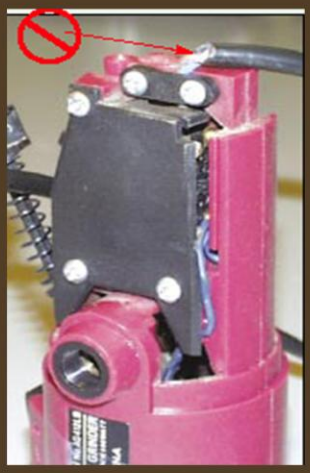
You should know something about tool maintenance and repair even if you are not responsible for these activities.

Portable powered tools should be kept clean. Dirt and grease can hide damage.

Maintain and repair tools before it is too late. Sharpen cutting edges regularly. Follow a schedule to make sure tools are lubricated. To prevent rust, lightly oil tools before putting them away.

Maintenance, repair:

- "Do Not Use"
- Authorized employees
- Inspect repairs



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Take damaged tools out of service immediately. Apply a "Do Not Use" warning tag so everyone knows not to sue the tool. Only authorized employees should be allowed to repair tools. Some types of tools must meet the manufacturer's specifications after they've been repaired. All repaired tools should be thoroughly inspected before they are put back into use.

Discard damaged tools that cannot be repaired.

Maintenance, repair:

- **Storage**

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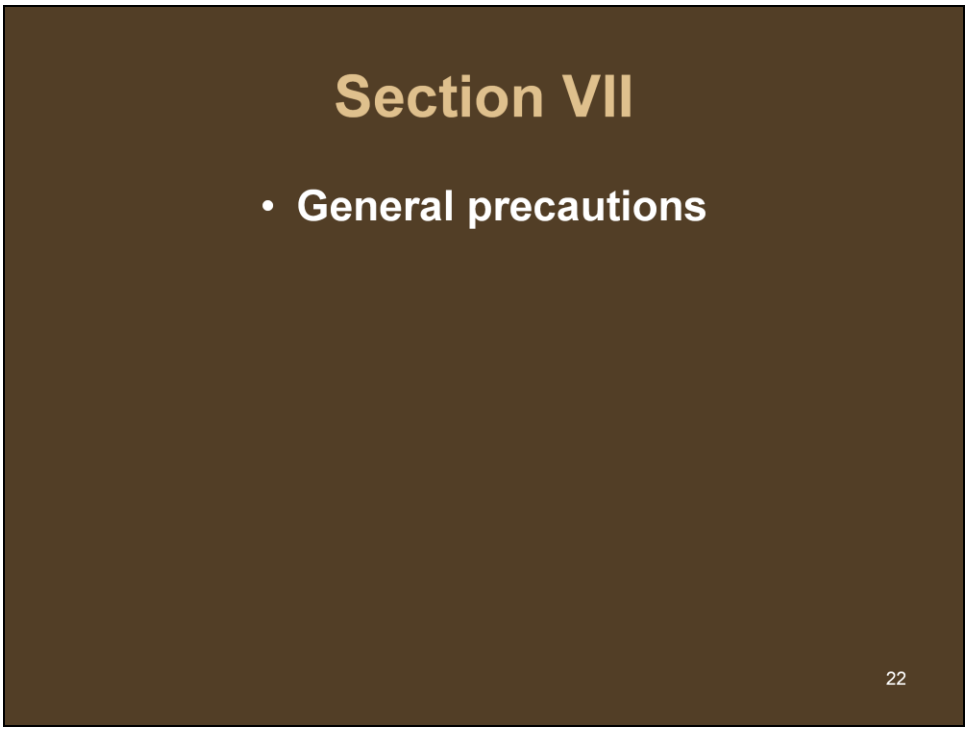
Use tool boxes or tool chests to keep tools organized. Hang larger tools on pegboards. It is easier to keep track of portable tools when they are put back where they belong after a job.



Even with the wide variety of portable powered tools available, there are general precautions for safe use that should always be followed.

Power sources:

- Electric
- Pneumatic
- Hydraulic
- Liquid fuel
- Powder-actuated

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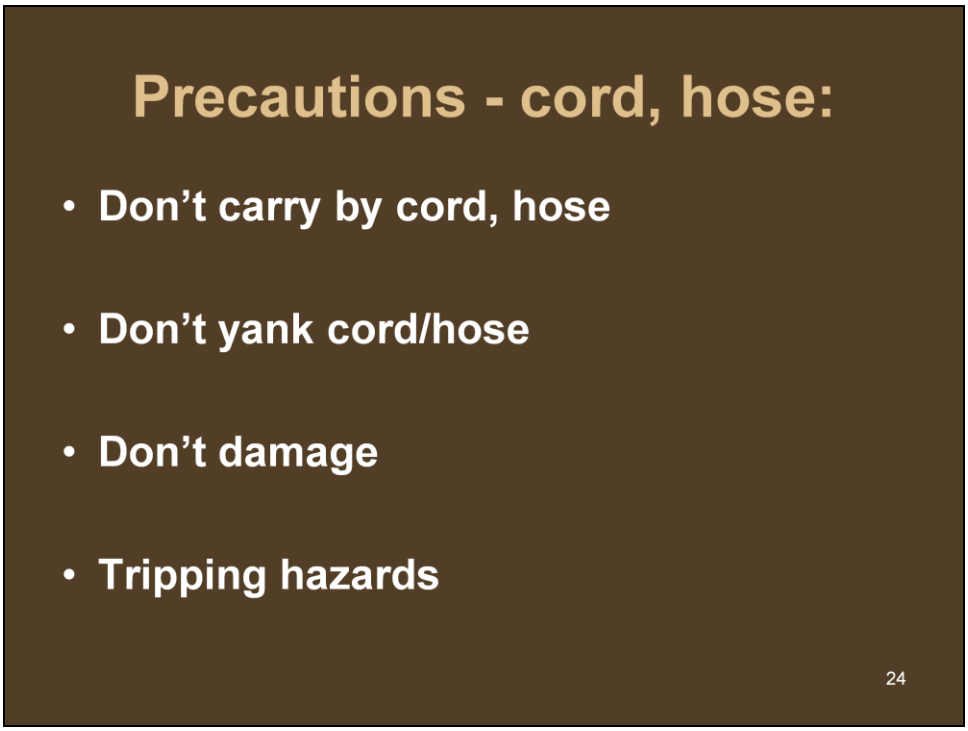
There are several types of power tools, based on the power source they use: electric, pneumatic, hydraulic, liquid fuel, and powder-actuated.



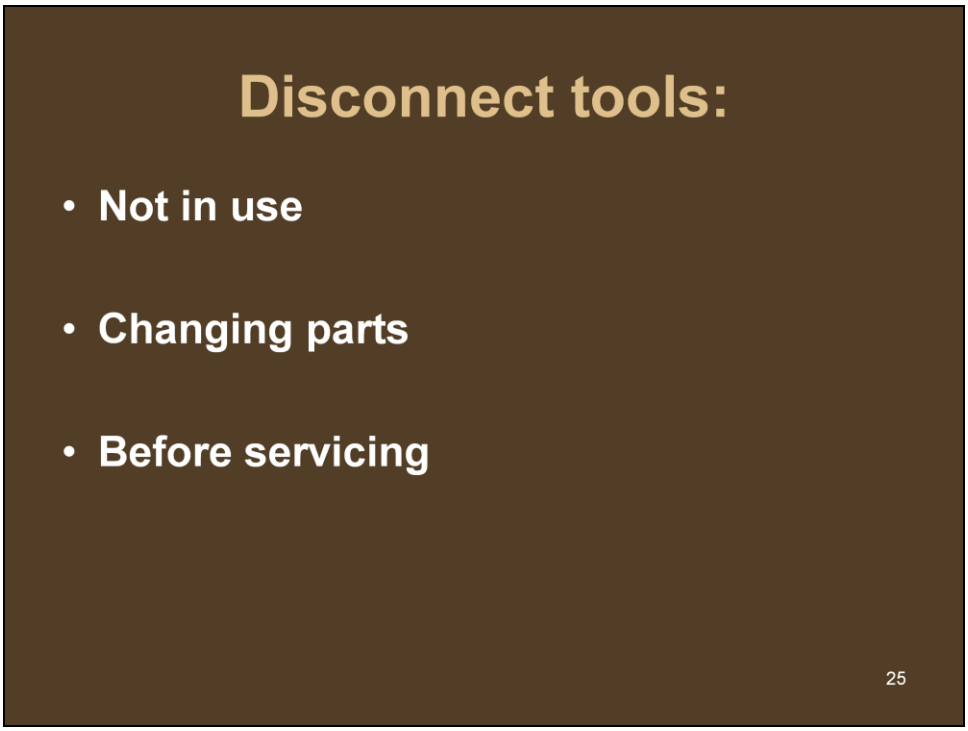
Since we have noted that power tools can be hazardous when improperly used, the following general precautions should be observed by power tool users:

Never carry a tool by the cord or hose.

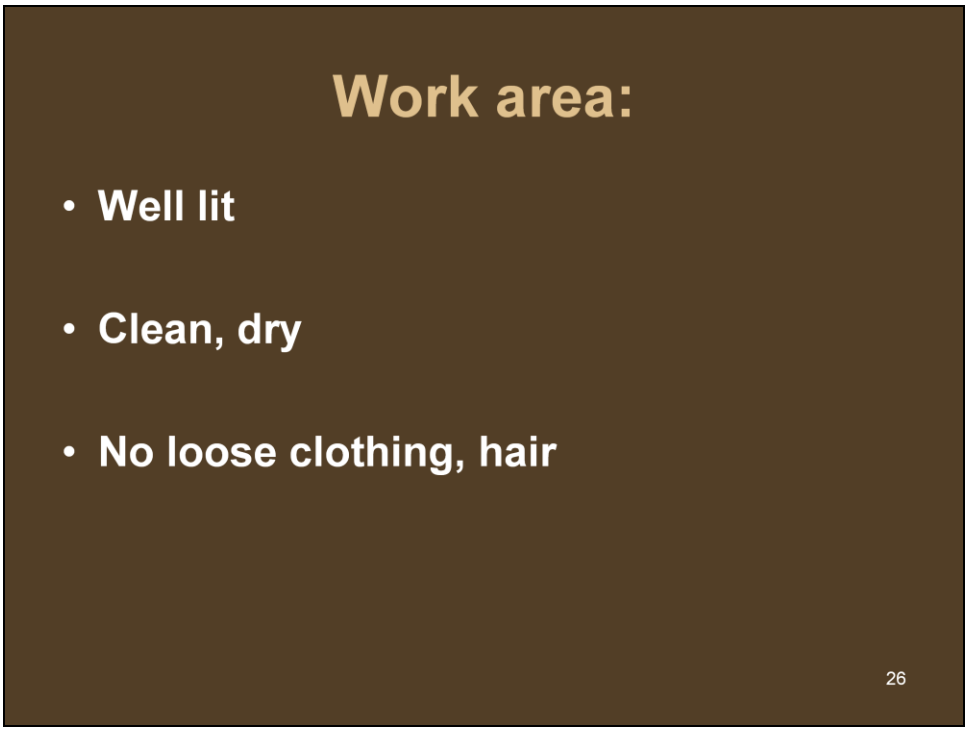
Never yank the cord or the hose to disconnect it from the receptacle.

Keep cords and hoses away from damaging heat, oil, and sharp edges.

Keep cords and hoses out of aisles or other places where they would be a tripping hazard.



Disconnect tools when they are not in use; when you change accessories such as blades, bits, and cutters; and before servicing and maintenance.



Keep work areas well lit when operating power tools.

Keep work surfaces clean and dry.

Wear appropriate clothing and tie back long hair. Loose clothing, ties, jewelry, and hair can become caught in moving parts.

Guards - moving parts:

- Point of operation
- In-running nip points
- Rotating parts
- Flying chips, sparks

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Guards are an important safety feature on power tools. They prevent contact with hazardous moving parts. For example, belts, chains, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, or other reciprocating, rotating, or moving parts of equipment must be guarded if workers could come into contact with them.

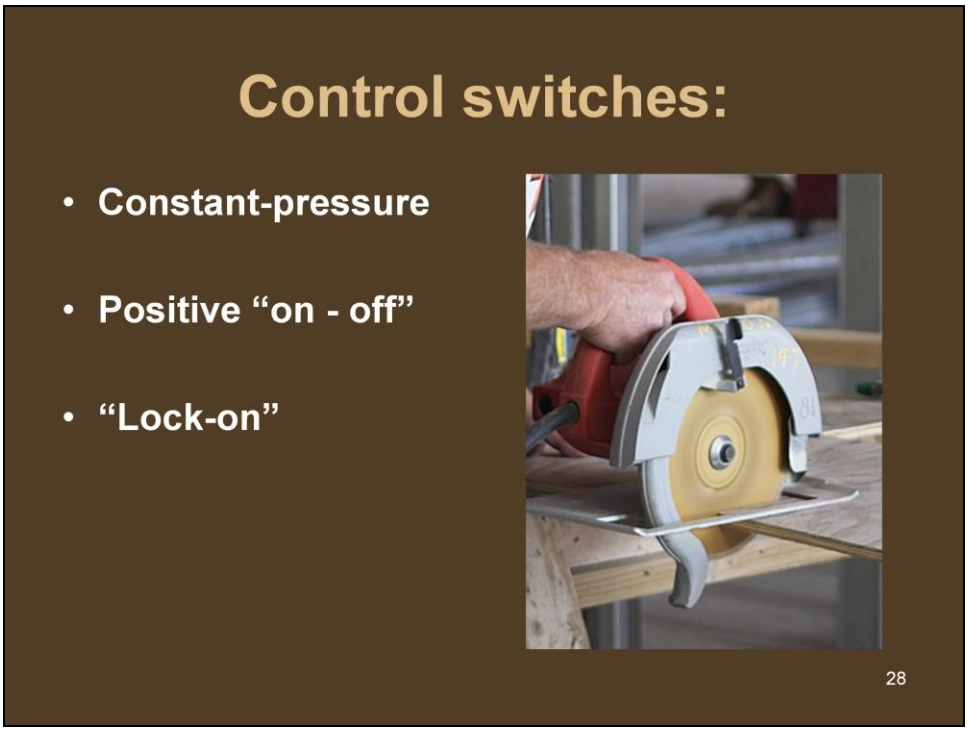
Guards, as necessary, should be provided to protect the operator and others from the following:

Point of operation

In-running nip points.

Rotating parts

Flying chips and sparks



Even the type of switch that controls power to the tool is a safety factor.

The following hand-held powered tools must be equipped with a constant pressure switch or control: drills; tappers; fastener drivers; horizontal, vertical, and angle grinders with wheels larger than 2 inches in diameter; disc sanders with discs larger than 2 inches; belt sanders; reciprocating saws, saber saws, scroll saws, and jigsaws with blade shanks greater than ¼ inch wide; and other similar tools. These tools also may be equipped with a "lock-on" control if it allows the worker to also shut off the control in a single motion using the same finger or fingers.

The following hand-held powered tools may be equipped with either a positive "on-off" control switch, a constant-pressure switch, or a "lock-on" control switch: platen sanders; disc sanders with discs 2 inches or less in diameter; grinders with wheels 2 inches or less in diameter; routers; planers; laminate trimmers; nibblers; shears; scroll saws; and jigsaws, saber and scroll saws with blade shanks ¼ inches wide or less. The constant –pressure controls witch is recommended as the preferred device.

Other hand-held powered tools such as circular saws having a blade diameter greater than 2 inches, chain saws, and percussion tools with no means for holding accessories securely must be equipped with a constant-pressure switch that will shut off the power when the pressure is released.

Portable abrasive blast cleaning nozzles must be operated by a valve that has to be held open manually. The nozzle can be mounted in a support when it is not in use.

Perhaps everyone is most familiar with electric power tools.

When you use any electric power tool, you should follow these general safe practices:

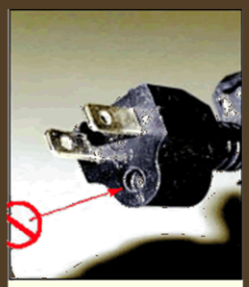
Do not use electric tools in damp or wet locations unless they are approved for that purpose.

Do not use electric tools in areas with a potentially flammable or combustible atmosphere unless they are designed for that purpose.

Ensure that power cords do not present a tripping hazard.

Electrocution and shock:

- Three-wire grounded cord
- Double insulated
- Low-voltage isolation transformer



Never use a three-prong grounding plug with the third prong broken off.

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Hazards unique to electric power tools are that they can cause shock, electrical burns, and electrocution. Under certain conditions, even a small amount of current can result in heart failure and death. A shock also can cause the user to fall off a ladder or other elevated work surface.

To protect the user from shock, tools must either:

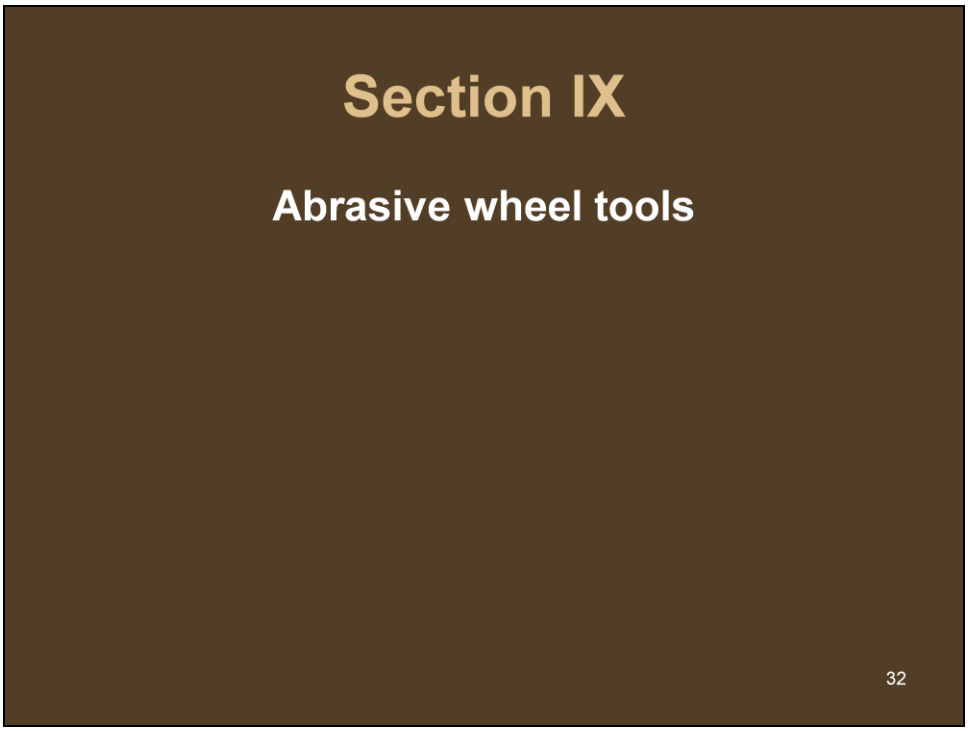
Have a three-wire cord with ground and be plugged into a grounded receptacle,

Be double insulated, or

Be powered by a low-voltage isolation transformer.

Three-wire cords contain two current-carrying conductors and a grounding conductor. One end of the grounding conductor connects to the tool's metal housing. The other end is grounded through a prong on the plug. Anytime an adapter is used to accommodate a two-hole receptacle, the adapter wire must be attached to a known ground. The third prong should never be removed from the plug.

Double insulation is more convenient. The user and the tools are protected in two ways: by normal insulation on the wires inside, and by a housing that cannot conduct electricity to the operator in the event of a malfunction.



Powered abrasive grinding, cutting, polishing, and wire buffing wheels create special safety problems because they may throw off flying fragments.

Abrasive wheel tools:

- Inspect
- Ring-test
- Speed rating

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Before an abrasive wheel is mounted, it should be inspected closely and “ring-tested” to be sure that it is free from cracks or defects. To test a wheel, mount it loosely on a stick and tap it gently with a light-metallic instrument. If the wheel does not produce a clear metallic tone or “ring,” the wheel may be cracked and it could fly apart in operation. A wheel that does not pass the ring test must not be used.

Check the spindle speed of the machine before mounting the wheel to make sure the speed does not exceed the wheel’s maximum operating speed, which is marked on the wheel.

Abrasive wheel guards:

- Wheel surface
- Chips
- Wheel fragments

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Portable grinding tools need to be equipped with safety guards to protect workers not only from the moving wheel surface and chips from the material being worked, but also from flying fragments in case the wheel should break.

Abrasive wheel tools:

- Eye protection
- Off when not in use
- Hand-held grinders

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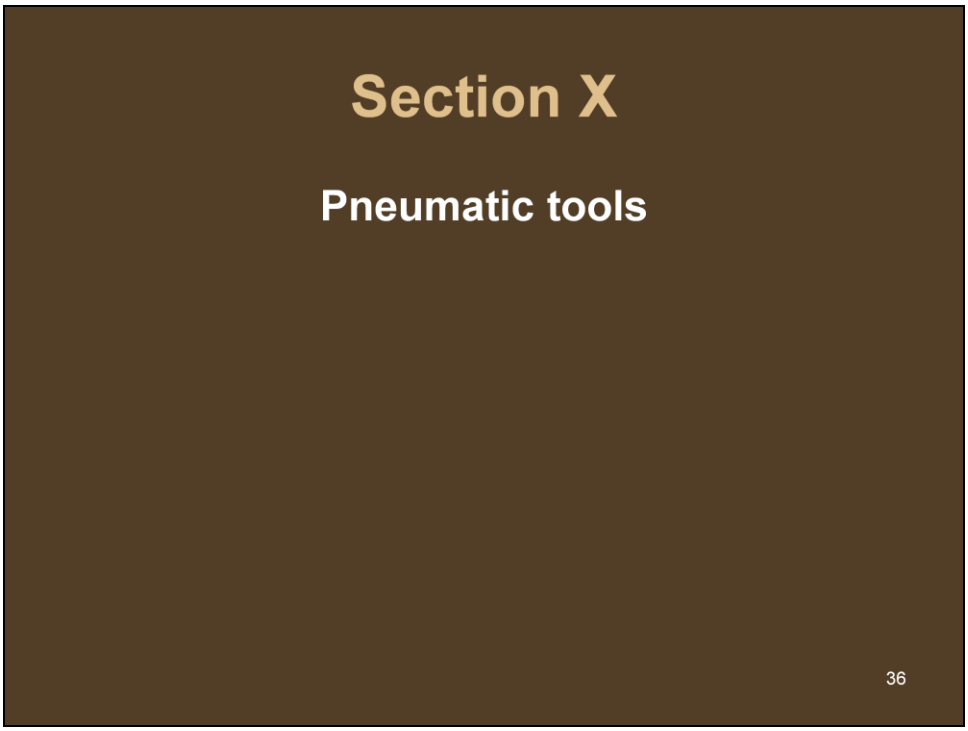
In addition, when using a powered grinder:

Always use eye protection
Turn off the power when not in use
Never clamp a hand-held grinder in a vise to use it as a stationary grinder.



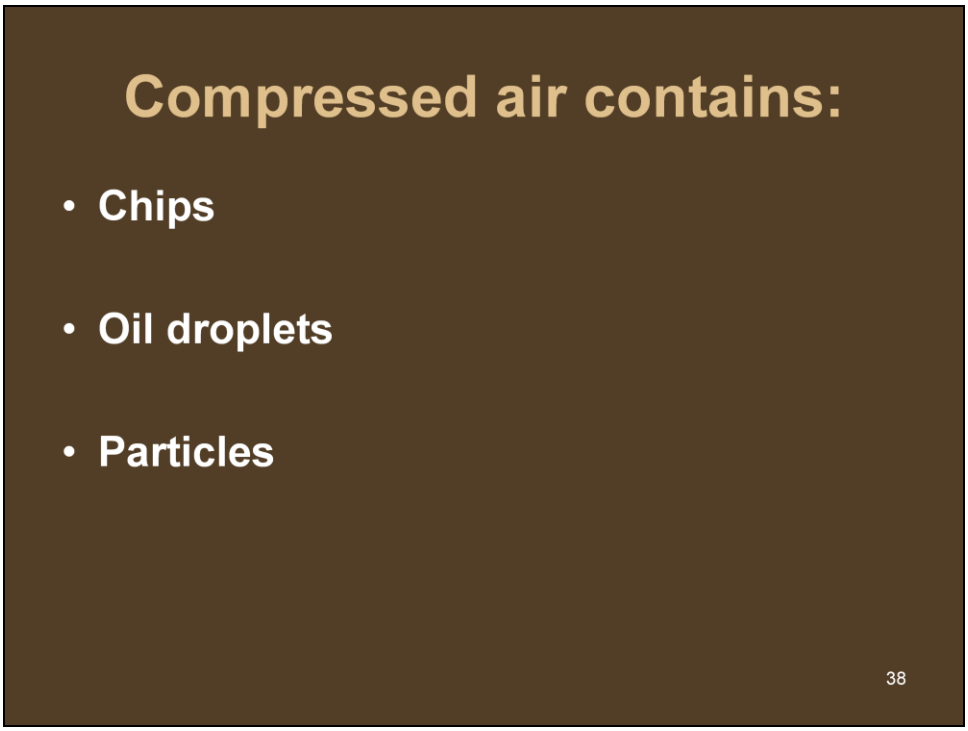
Another common type of tool in the workplace is the pneumatic tool.

Pneumatic tools are powered by compressed air and include chippers, drills, hammers and sanders. The main danger involved with using pneumatic tools is the hazard of getting hit by one of the tool's attachments or by some kind of fastener the worker is using with the tool.

When using pneumatic tools, employees must check to see that they are fastened securely to the hose to prevent them from becoming disconnected. A short wire or positive locking device attaching the air hose to the tool will sere as an added safeguard.

Screens must be set up to protect nearby workers from being struck by flying fragments around chippers, riveting guns, staplers, or air drills.

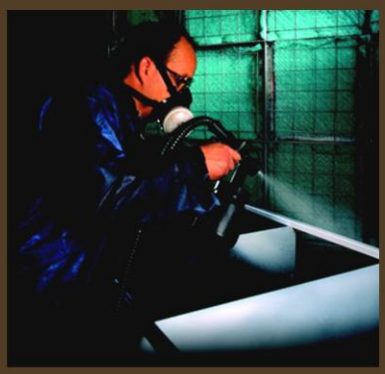
Eye protection is required and face protection is recommended for employees working with pneumatic tools. Noise is another hazard. Working with noisy tools such a jackhammers requires proper, effective use of hearing protection.



When a source of compressed air is handy, it is tempting to use the air for cleaning the work area. Using compressed air for cleaning tasks can be a risky proposition. Compressed air typically contains chips, oil droplets, particles, and other debris that can cause serious injuries to eyes, ears, and even intact skin.

Compressed air for cleaning:

- Reduced pressure
- Less than 30 p.s.i.
- Chip guarding
- PPE



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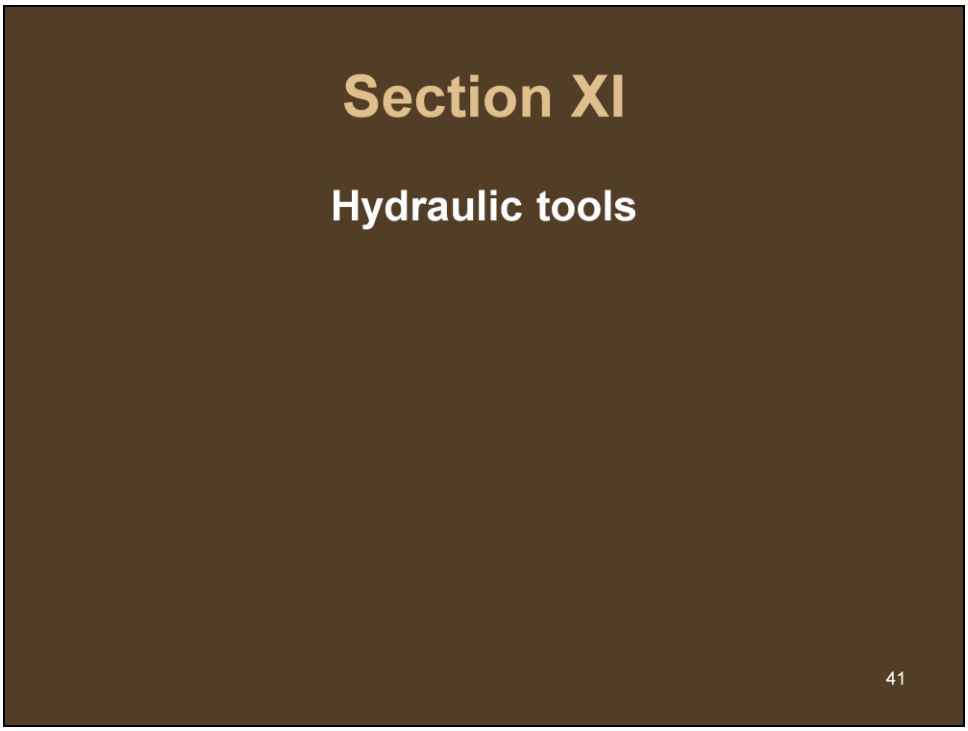
According to OSHA, compressed air cannot be used for cleaning purposes (work surfaces) unless the pressure is reduced to less than 30 p.s.i., and then only when effective chip guarding and personal protective equipment is used.

Compressed air guns should never be pointed toward anyone. Users should never "dead-end" an air gun against themselves or anyone else. For worker safety, never use compressed air to clean off clothing. OSHA recommends that workers use a brush to remove dust and debris from clothing. Wearing disposable coveralls will also help keep clothing clean during dusty jobs.



Sometimes you will need to use hydraulic power tools.

Recommended pressures:

- Hoses
- Valves,
- Pipes
- Filters
- Fittings

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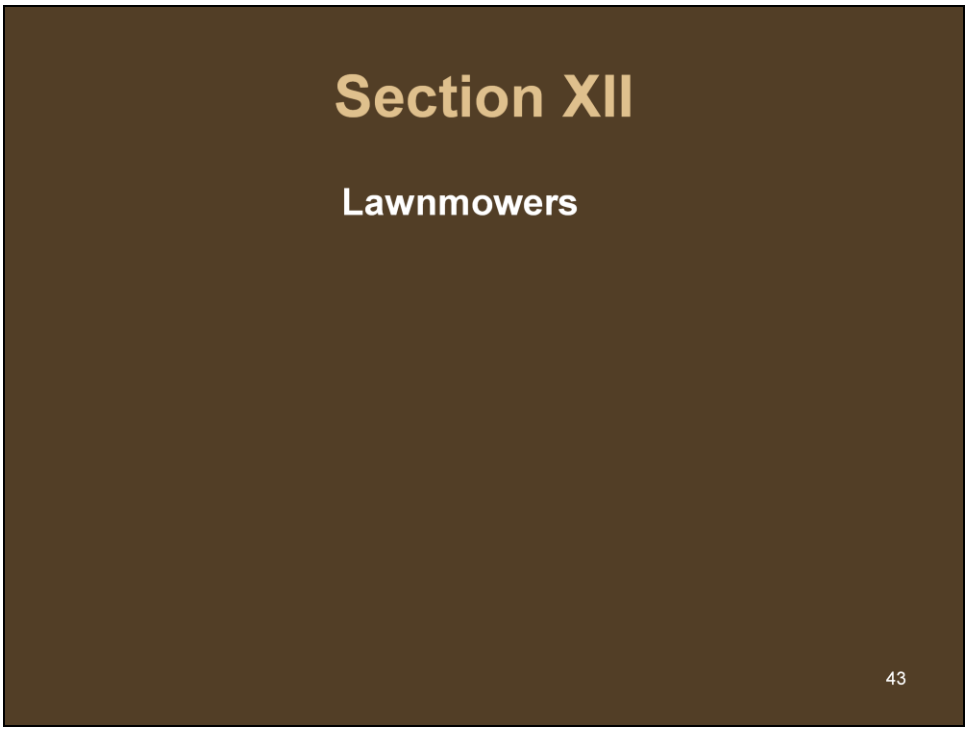
Hydraulic tools get their power from liquid under pressure.

The manufacturer’s recommended safe operating pressure for hsoes, valves, pipes, filters, and other fittings must not be exceeded.



Even though you may have plenty of experience using a power lawnmower at home, you still need to follow proper procedures when you use this equipment at work.

Lawnmowers:

- Guards
- Shut-off device
- Controls identified
- Start in “neutral”
- Instruction manual

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There are several safety requirements for all types of power mowers:

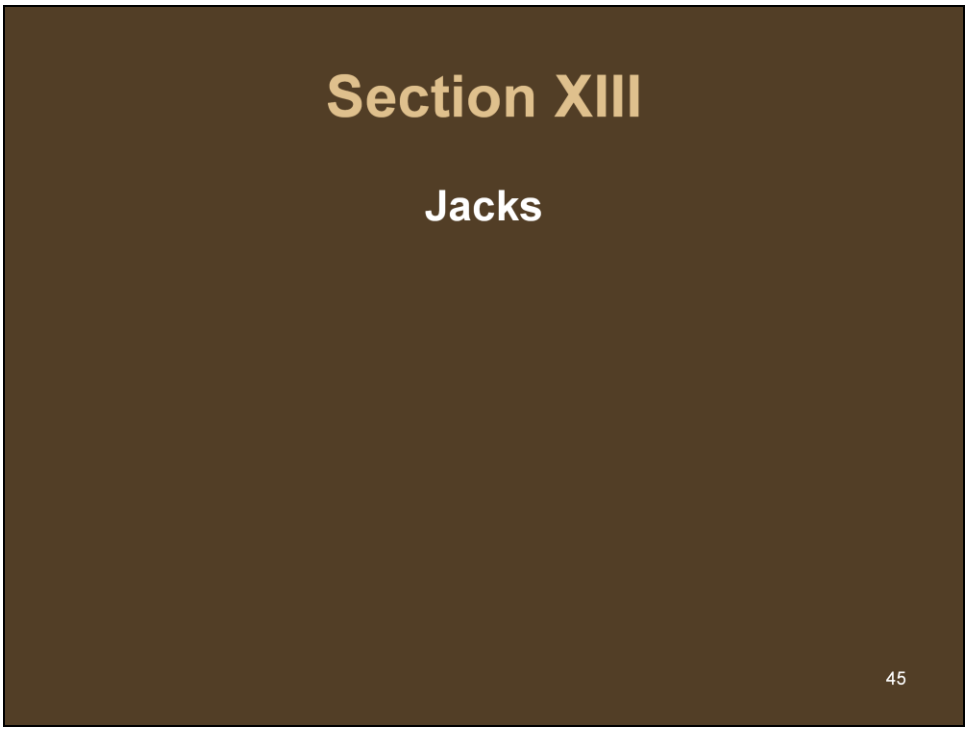
Power-driven chains, belts, and gears must be guarded.

The mower’s shut-off device has to be manually operated to re-start the mower.

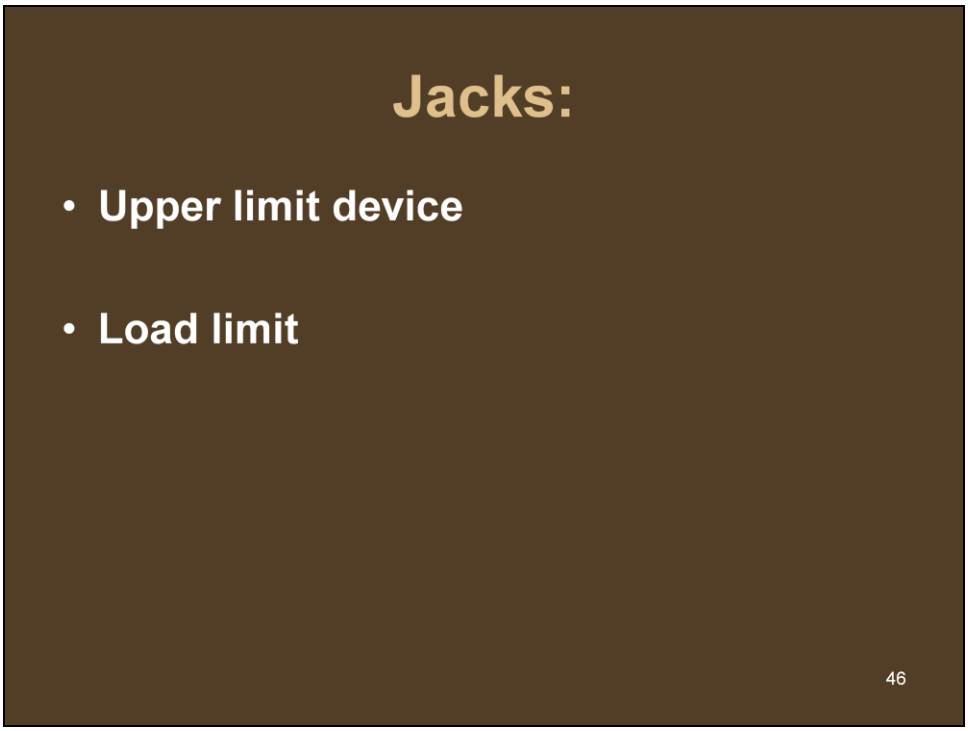
The positions of the operating controls have to be clearly identified.

Self-propelled mowers have to show a caution statement to remind operators to put the controls in neutral before starting the engine.

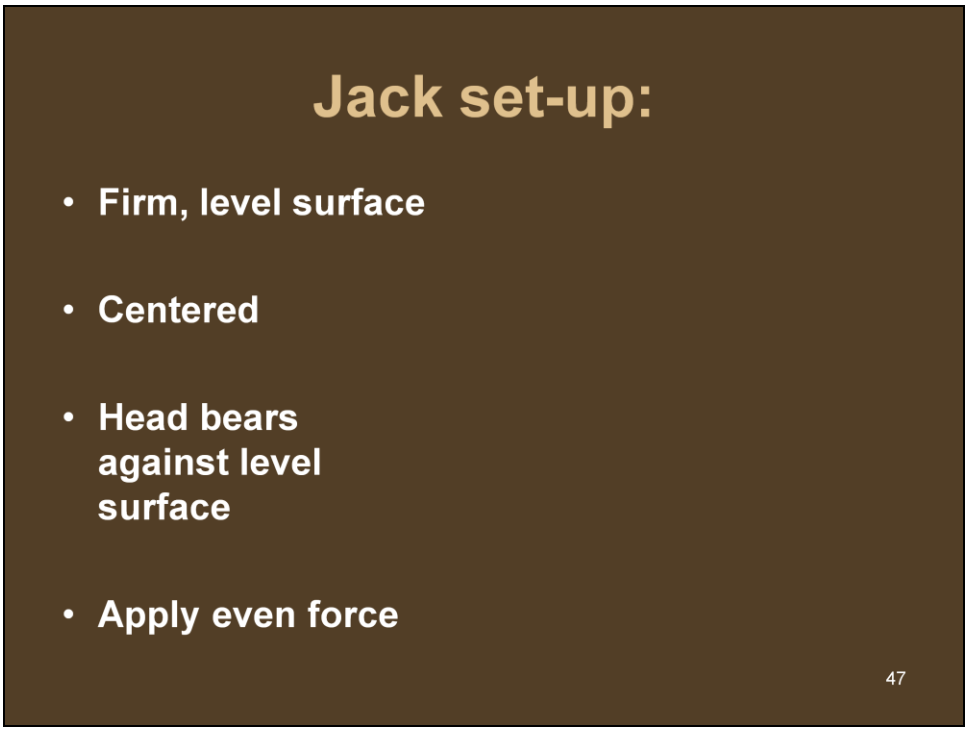
Always review the mower’s instruction manual for details on how to inspect, operate, and maintain the equipment.



You may not need to use a portable jack every day, but when you use one, follow these precautions.



All jacks (lever and ratchet jacks, screw jacks, and hydraulic jacks) must have a device that stops them from jacking up too high. Also, the manufacturer's load limit must be permanently marked in a prominent place on the jack and should not be exceeded.

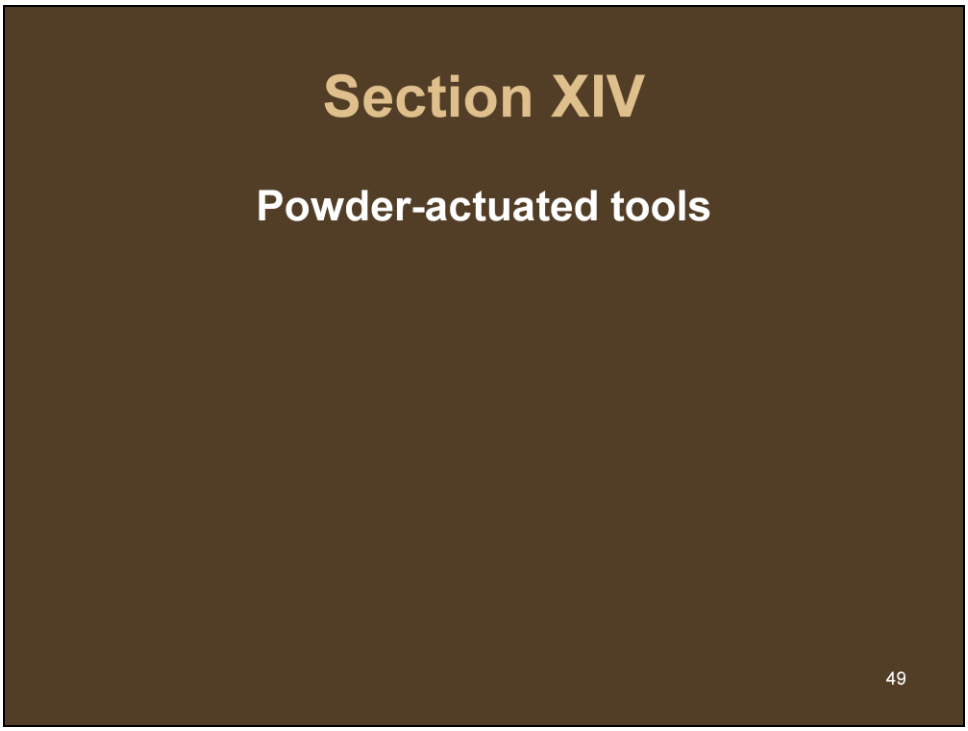


To set up a jack, make certain of the following:

The base rests on a firm level surface.
The jack is correctly centered.
The jack head bears against a level surface
The lift force is applied evenly

Proper maintenance of jacks is essential for safety. Hydraulic jacks exposed to freezing temperatures must be filled with an adequate antifreeze liquid. All jacks must be lubricated regularly.

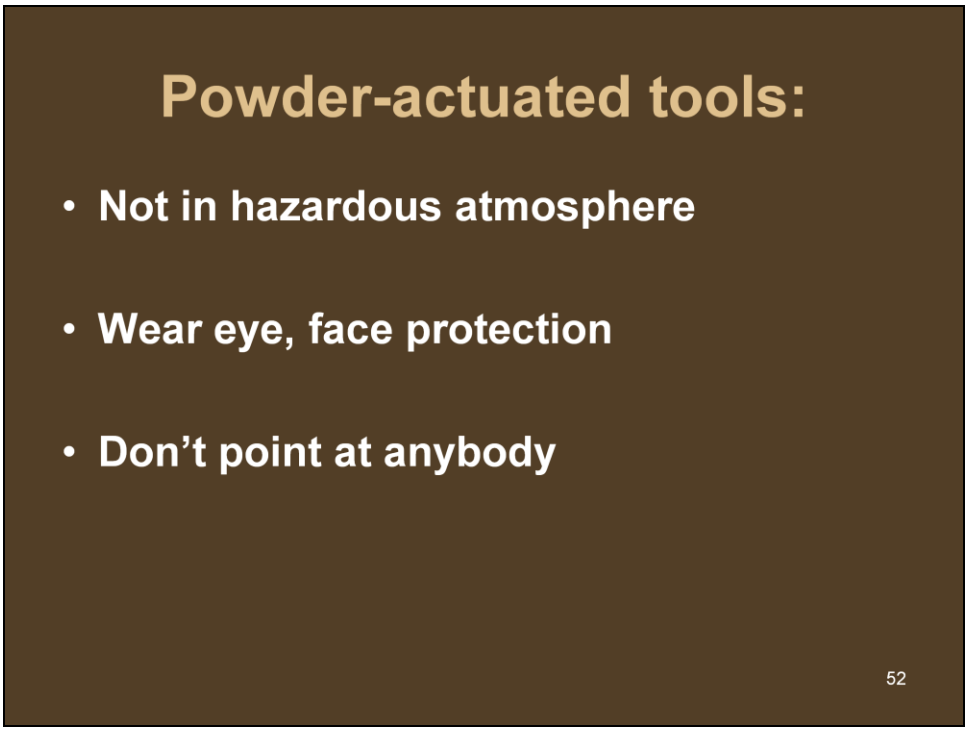
In addition, each jack must be inspected at least once every six months when it is used at one site. Jacks that are sent out need to be inspected when sent out and when returned. Jacks that are to be subjected to abnormal loads or shock must be inspected before use and immediately thereafter.



Never operate a powder-actuated tool unless your employer has authorized you to use it.

Powder-or explosive-actuated tools operate like a loaded gun and should be treated with the same respect and precautions. In fact, they are so dangerous that they should be operated only by specially trained employees.

Before using the tool, the worker should inspect it to determine that it is clean, all moving parts operate freely, the barrel is free from obstructions, and the manufacturer recommended shielded, guard, or attachments are in place.

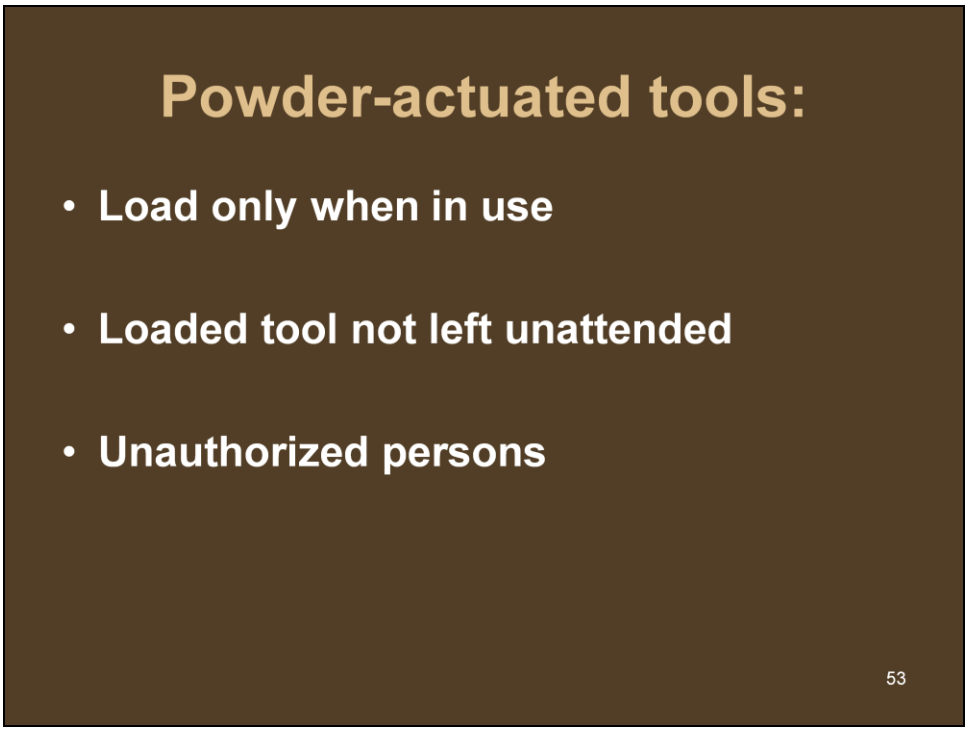


Safety precautions to remember include the following:

These tools should not be used in an explosive or flammable atmosphere;

Suitable eye and face protection for the operator and assistants is essential when using a powder-actuated tool; and

The tool must never be pointed at anybody.

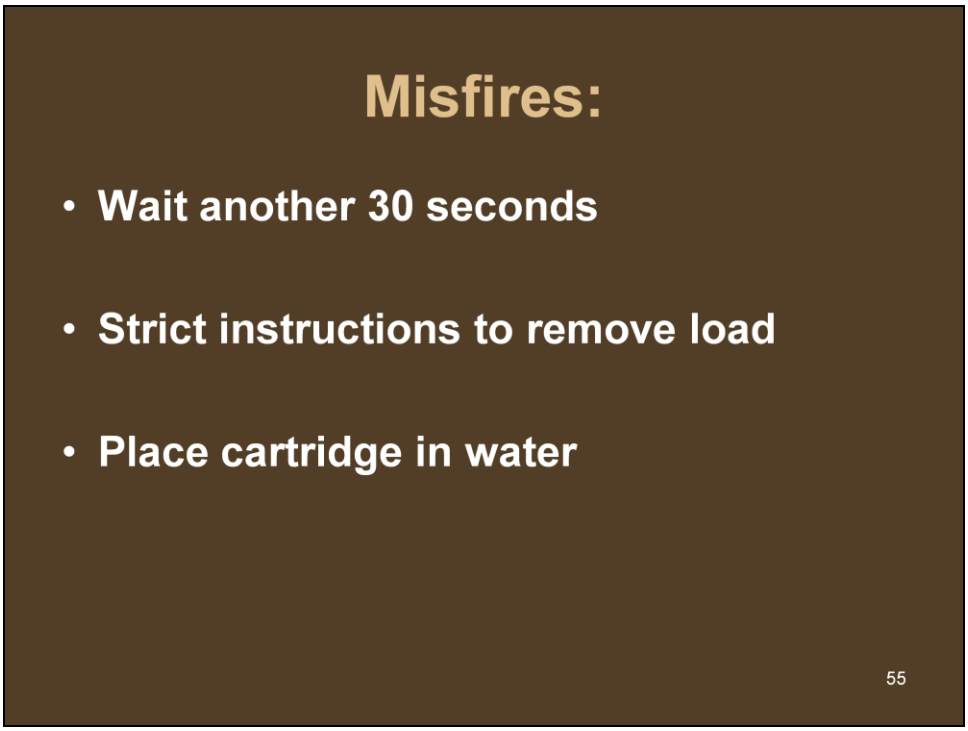


The tool should not be loaded unless it is to be used immediately;

A loaded tool should not be left unattended.

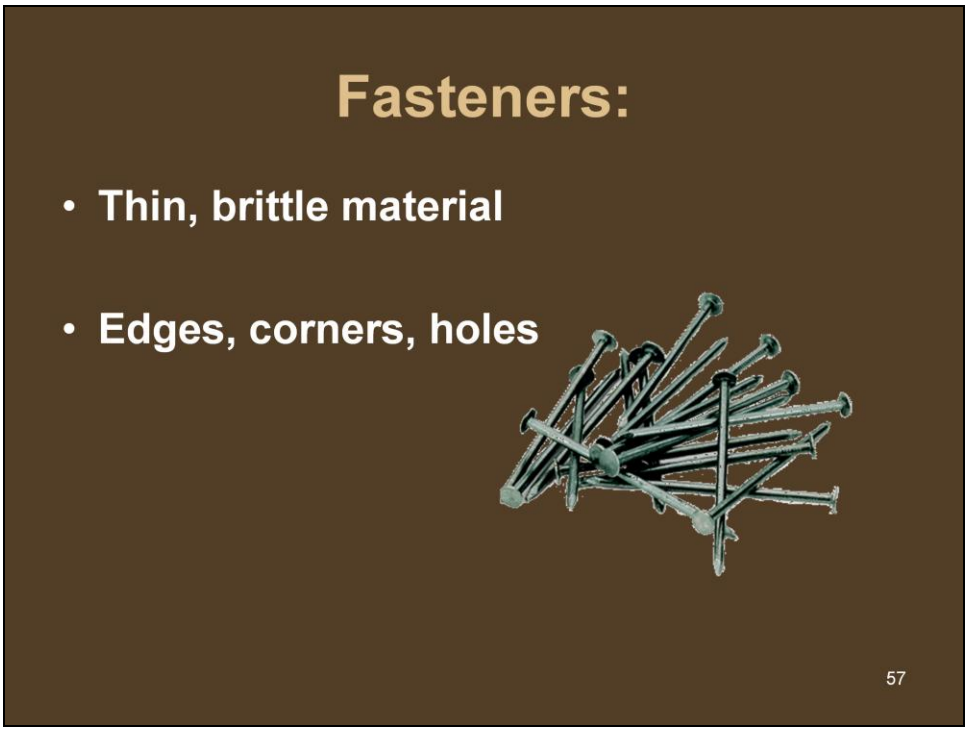
The tool should never be left unattended where it would be available to unauthorized persons.

If a powder-actuated tool misfires, the operator should wait at least 30 seconds, then try firing it again.



It it still will not fire, the operator should wait another 30 seconds so that the faulty cartridge is less likely to explode, then carefully remove the load in strict accordance with the tool manufacturer's instructions. The bad cartridge should be put in water.

If the tool develops a defect during use it should be tagged and taken out of service immediately until it is properly repaired. Repairs must meet the tool manufacturer’s specifications.



Since powder-actuated tools are usually used to apply fasteners, there are some additional precautions to consider.

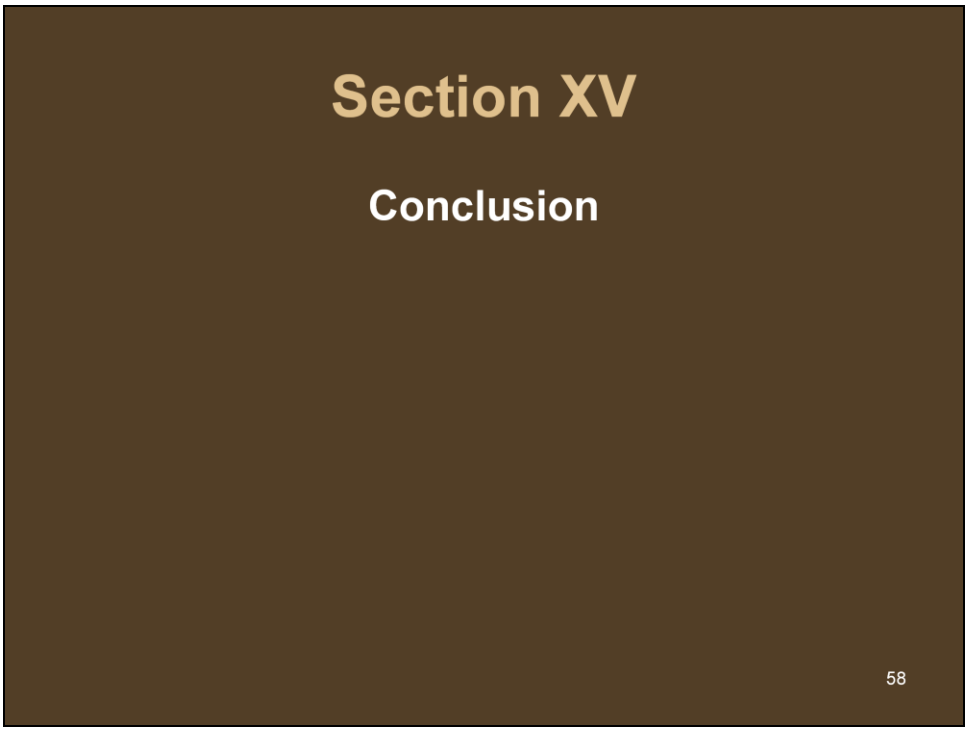
Fasteners must not be fired into material that would let them pass through to the other side.

Fasteners must not be driven into very hard or brittle materials which might chip, splatter, or make the fastener ricochet.

High-velocity tools may not be used to drive fasteners into materials like brick or concrete any closer than 3 inches to an unsupported edge or corner. High-velocity tools may not be used to place fasteners in steel any closer than ½ inch from an unsupported corner edge unless a special guard, fixture, or jig is used.

An alignment guide must be used when shooting a fastener into an existing hole.

A fastener must not be driven into a spalled area caused by an unsatisfactory fastening.



This presentation has provided a general overview of portable powered tools.

To summarize, we:

Discussed power tools hazards and potential injuries.
Described the importance of tool quality and design.
Outlined proper job-set up and PEP considerations.
Explained tool inspection, maintenance, and repair procedures.
Introduced various types of portable powered tools.

Now take the Portable Power Tools Test for credit!